Computer Science

AIRPORT SECURITY USING MULTI MODELING AND EVENT LOGIC

Abhilasha Bhargav and Umut Topkara*
CERIAS 1315 Recitation Building
Purdue University
West Lafayette, IN 47907-1315
bhargav@purdue.edu

Airport security is one of the major concerns in the world today. One step towards achieving security is to create suspicion at the right time. This paper proposes the need of a network interface for the security devices already in use, which will continuously give input to an "intelligent center" implementing an algorithm to signal suspicion when required. My work is to define a cost effective model, and show theoretically how well the algorithm could work in such a model. Thus one can see if it is realizable and useful in the real world.

There are two main parts to this proposal. The first part is based on the fact that "Group judgments reduce the error of judgment". Face-recognition techniques, for example, are not really useful by themselves. Nevertheless, if it is combined with areas that include speech, gesture and emotion recognition, the probability of success increases greatly. A good choice of input from these devices can be used to feed to the main algorithm. Also tracked motion data could be used to calibrate distributed sensors to calculate rough site models, to classify detected objects, to learn common patterns of activities for different object classes and to detect unusual activities. A model of a network interface is required where this can be done successfully.

The second part is the algorithm itself. This will be a combination of data mining and machine learning techniques along with the concept of collective intelligence. The heart of the idea is to use event logic to describe the events in the world. This idea has been presented by Prof. Jeffery Mark Siskind and has successfully been implemented in the visual domain. Further research is also in progress to implement it in other domains. An event can be described as a combination of sight, sound position etc. that is fed in to this algorithm using techniques like the one listed above. We get series of events at run time, and the algorithm continuously and intelligently learns the normal pattern. It should also be able to weigh the importance of the different sources (visual, sound etc) at run time through the process of learning. Once this is known, suspicion can be detected with a good probability.

The way this is set up there is also scope for actions that can be taken if we include monitoring other devices with human involvement. There are currently some evolving visually guided robots, which show that neural-network control architectures can be evolved for an accurate simulation model of a visually guided robot. Structures like these (which could also be human) distributed (or moving) all around the airport and serve as nodes of a network, at the heart of which the algorithm is implemented. The data collected will not be completely accurate but would be able to detect trouble, sometimes even with information of the kind of trouble. This should generate a suspicion signal, which can inform authorities. Thus this also provides automata and assistance to the security officers. Implementation of such a large scale project requires a good well analyzed model which is the aim of this project.

References

[Siskind] `Grounding the Lexical Semantics of Verbs in Visual Perception Using Force Dynamics and Event Logic,' *Journal of Artificial Intelligence Research*, volume 15, pp. 31-90, August 2001. Also available as Technical Report 2000-105, NEC Research Institute, Inc., July 2000

[Weiss] H. Weiss, "Genetic Algorithms", http://www.op.dlr.de/FF-DR/dr_mkd/staff/weiss/papers/gaintro.pdf

[Szuba] T. Szuba aidx Szuba, Tadeusz. Evaluation measures for the collective intelligence of closed social structures. http://ipdps.eece.unm.edu/1998/biosp3/bispp12.pdf

[CNET] S.Olsen, R.Lemos, "Can Face recognition keep the airports safe?, " http://news.com.com/2100-1023-275313.html?legacy=cnet

[GR] Gesture Recognition, http://webopedia.lycos.com/TERM/G/gesture_recognition.html

[Picard] R.W.Picard, E.Vyzas, J.Healey, "Toward Machine Emotional Intelligence: Analysis of Psychological Affective State" http://www.content-wire.com/Home/Index.cfm?ccs=86&cs=995

[PAMI] Pattern Analysis and Machine Intelligence http://www.computer.org/tpami/tp2001/i1175abs.htm http://www.ai.mit.edu/projects/vsam/Publications/vsam-cvpr98.pdf

[Joshi] Decision Trees http://www-users.cs.umn.edu/~mjoshi/hpdmtut/sld035.htm

[Cliff] D.Cliff, P.Husbands and I.Harvey, "Evolving Visually Guided Robots" http://citeseer.nj.nec.com/cache/papers/cs/6043/ftp:zSzzSzcoast.cs.purdue.eduzSzpubzSzdoczSzgenetic_algorithmszSzappszSzEvolving-Visual-Robots.pdf/cliff92evolving.pdf